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On the generic position of *Spinotarsus caboverdus* (Spirostreptida: Odontopygidae)

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ABSTRACT

The agricultural pest species *Spinotarsus caboverdus* (Pierrard, 1986), accidentally introduced into the Cape Verde islands from a mainland source, is transferred into the Angolan genus *Bandeirenica,* clarifying the question of its likely origin.

The diplopod family Odontopygidae is endemic to the African continent, over which it is dispersed in riotous diversity and abundance. Interestingly enough, it is not represented on Madagascar or the Comores even though these islands are populated by various other East African milliped taxa. Perhaps odontopygids were simply not present in southeastern Africa prior to opening of the Mozambique Channel.

The presence of odontopygids in the Cape Verde islands was unknown until 1982, when Henrik Enghoff reported a species, considered to be a common agricultural pest, in a small collection of millipeds made on Ilha Santo Antão. Noting the uncertainty of generic concepts in the Odontopygidae, Dr. Enghoff provisionally referred the species to *Tibiomus,* with the qualification that it might have been introduced from a mainland source. Several years later, a detailed account of this species on Santo Antão was provided by Jolivet (1986), who used the generic name *Spinotarsus* on the advice of J.-M. Demange. Jolivet considered this small milliped to be a formidable crop pest which almost precluded the cultivation of potatoes in the Cape Verde islands.

This generic assignment was endorsed in the following year by G. Pierrard (1986) in proposing the new name *Spinotarsus caboverdus*. Looking for its relatives among the some 80 described species of the genus, Pierrard suggested a close affinity with the four members of the *S. grandis* Group, thus implying liklihood of introduction from a South African source.

Most recently, a thorough review of the situation was provided by Neves, van Harten, & McKillup (1993), to which source further reference is made under the heading "Commentary".

Several years ago I received from my colleague Luis A. Pereira (La Plata) a sample of odontopygids which were sent to him by Cape Verdean scientists working on control measures for the species. An attempt to identify the material provided a welcome impetus for a personal investigation of its characters and status of *caboverdus*, as I had long been skeptical about placement in *Spinotarsus*. My findings and impressions are outlined as follows.

Genus ***Bandeirenica*** Kraus

Bandeirenica Kraus, 1960, Ann. Mus. Roy. Afr. centr., sci. zool., 82: 19. Proposed for two species; type species, *Spinotarsus bandeirensis* Kraus, 1958 (Angola), by original designation.

This genus was set up to contain two Angolan species which had originally (Kraus, 1958) been described in *Spinotarsus*. The generic diagnosis was not comparative, and the affinities of *Bandeirenica* could only be determined by reference to the key to genera of Odontopyginae (Kraus, 1960: 11-13), in which it shared couplet 28 with *Syndesmogenus*. The only distinction between the two, thus the rationale for recognizing *Bandeirenica*, was the absence of a basally-directed process at the apex of the gonocoxite in the two Angolan species.

The examination of the Cape Verde specimens and several species of *Syndesmogenus* from Tanzania, as well as gonopod illustrations in the literature, leads me to the conclusion that the species of these two nominal taxa are extremely similar in nearly all characters, and that an adequate revision might lead to their combination under the older name *Syndesmogenus* (Attems, 1909). It may be noted that among other - presumably monophyletic - genera of Odontopygidae, the presence or absence of a retrorse gonocoxal process is not accorded more than specific value. For the present, being unable to conduct the necessary broader investigation, I retain *Bandeirenica* for at least its charter membership, plus the one now under consideration.

It is significant that specimens of *caboverdus* sent to Dr. C.A. W. Jeekel for identification were suspected to be referable to *Syndesmogenus* (Neves, van Harten, & McKillup, 1993: 327)., confirming my own initial impression.

The gonopods in this group are certainly not easy to distinguish from those of *Spinotarsus*, and it is easy to see why they were originally placed in that genus. It is even possible that Dr. Demange had these Angolan species in mind when he placed Cape Verdean material in *Spinotarsus*. The "basal lamella" said to characterize that genus is quite variable in its expression, sometimes quite inconspicuous. The lack of dorsal paraproctal spines in *Bandeirenica* (and *Syndesmogenus*) provides a fairly tangible distinction, however.

Bandeirenica caboverda (Pierrard), new combination
(Figures 1-5)

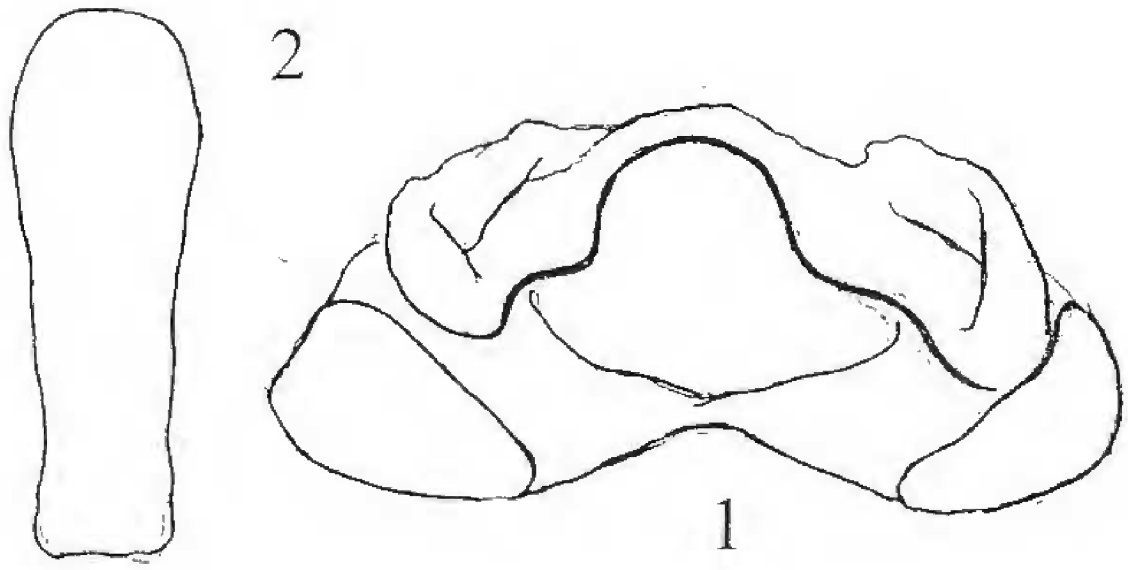
Tibiomus sp., Enghoff, 1982, Cour. Forsch.-Inst. Senckenberg, 52: 137.
Spinotarsus sp., Jolivet, 1986, L'Entomologiste, 42: 45.
Spinotarsus caboverdus Pierrard, 1987, Rev. Zool. afr., 101: 476, figs. 1-5. Male holotype and numerous additional specimens (Mus. Roy. Afr. Centr.) from Ribeira Grande, Ilha Santo Antáo, República do Cabo Verde, G. Pierrard leg. 5 September 1984.
Spinotarsus caboverdus: van Harten, Neves, & Enghoff, 1993, Invest. Agraria, 4: 14 (name only).
Spinotarsus caboverdus: Enghoff, 1993, Tropical Zoology, 6: 214.
Spinotarsus caboverdus: Neves, van Harten, & McKillup, 1993, Cour. Forsch.-Inst. Senckenberg, 159: 327.

In my opinion, the gonopod drawings published with the original description very clearly show the characters attributed by Professor Kraus to *Bandeirenica.* I provide here copies of the illustrations of the gonotelopodites for both *caboverdus* and *B. bandeirensis* (Kraus), using Pierrard's lettering on both figures to indicate homologous structures. Allowing for trivial differences in drawing techniques, and the known difficulty of adequately showing nuances of detail in essentially transparent objects, these drawings obviously represent the similar structures of two closely related, congeneric species.

To satisfy my own curiosity about several points of uncertainty, I secured paratype material (thanks to Dr. Rudy Jocqué, Museum Royale de Afrique Central) for a personal examination. Drawings made from MRAC 15.676 show essential agreement with those of M. Pierrard, with the exception that femoral spine "f" is much longer than indicated by him (owing possibly to a difference in perspective).

In this genus, the tibiotarsal region is unusually short, and has the form of a thin sclerotized lamina curled on itself to form a short, conchoid tube open on the posterior side. In *caboverdus*, the long, compressed, unbranched solenomere makes almost two complete loops around this element, apparently to a much greater extent than indicated by Kraus for the two known Angolan species.

In this huge, protean group of recently evolved species, any character that may aid in deciphering relationships must be carefully considered. I believe that the shape of the posterior gonopodal sternum is fairly constant within genera defined on other bases, and that illustration of its shape should be added to subsequent taxonomic descriptions. Although my material of *Spinotarsus* is inadequate to indicate the extent of variation throughout the genus, I give (Fig. 1) a sketch made from a member of the *S. magnus* species-group to contrast with the same structure in *B. caboverdus* (Fig. 2). The differences, if constant, are more substantial than those evident in gonopod structure.



Figs. 1, 2. Posterior sterna of 7th segment, aboral aspect. 1, *Spinotarsus* of the *magnus*-group of species, showing complex structure and deep central cavity. 2, *Bandeirenica caboverda*, a simple flat elongated sclerite.

COMMENTARY

Bandeirenica caboverdus provides another example of an organism, doubtless not abundant in its home range, becoming astronomically abundant and of major economic importance when introduced into a new, hospitable territory lacking the original natural factors controlling population sizes. Several of the papers cited in the following reference list detail the impact of this small animal upon agricultural practices in the Cape Verde islands.

Noting the practical difficultly of controlling this pest species on Santo Antão with pesticides, Jolivet remarked "La lutte biologique reste possible mais nécessitara des recherches longue, coûteuses et approfondies dans le pays d'origin du diplopode." This requirement was restated by Neves, van Harten, & McKillup (1993), in discussing the option of biological control: "Unfortunately, however, this approach cannot be pursued until the country of origin of *S. caboverdus* is known." Previous ambiguity about the generic placement of *caboverdus* has obscured determination of its native distribution, the first step in searching for organisms of possible value in biological control on the Cape Verde islands.

Pierrard himself had suggested (1987: 473) a logical target with his remark "Il est probable que le nouvel Odontopyge a été introduit accidentellement . . .les apports de matériel végétal, principalement en provenance des pays lusitanophones du continent. . ." Indeed, a recent paper by van Harten, Neves, & Enghoff (1993) outlined the failure of an attempt in 1989 to locate the species in nearby Guinea-Bissao (a former Portuguese colony), considered to be a possible source of the insular population. No specimens of *caboverda* were found, although seven other species of odontopygids were collected.

Ironically, the place to look was already specified by Jolivet (1986: 45) in the original notice about this species: "Il semble originaire d'Afrique méridionale et a dû être importé au Cap Verde avec des plantes en pot originaires d'Angola." Relocation of *caboverdus* into *Bandeirenica* confirms that insight, and since both of the known Angolan species of the genus occur in the southwestern fourth of that country, any further search for the homeland of *caboverda* should be focused in that region.

The dependence of applied biology upon sound taxonomy is again emphasized by this situation.

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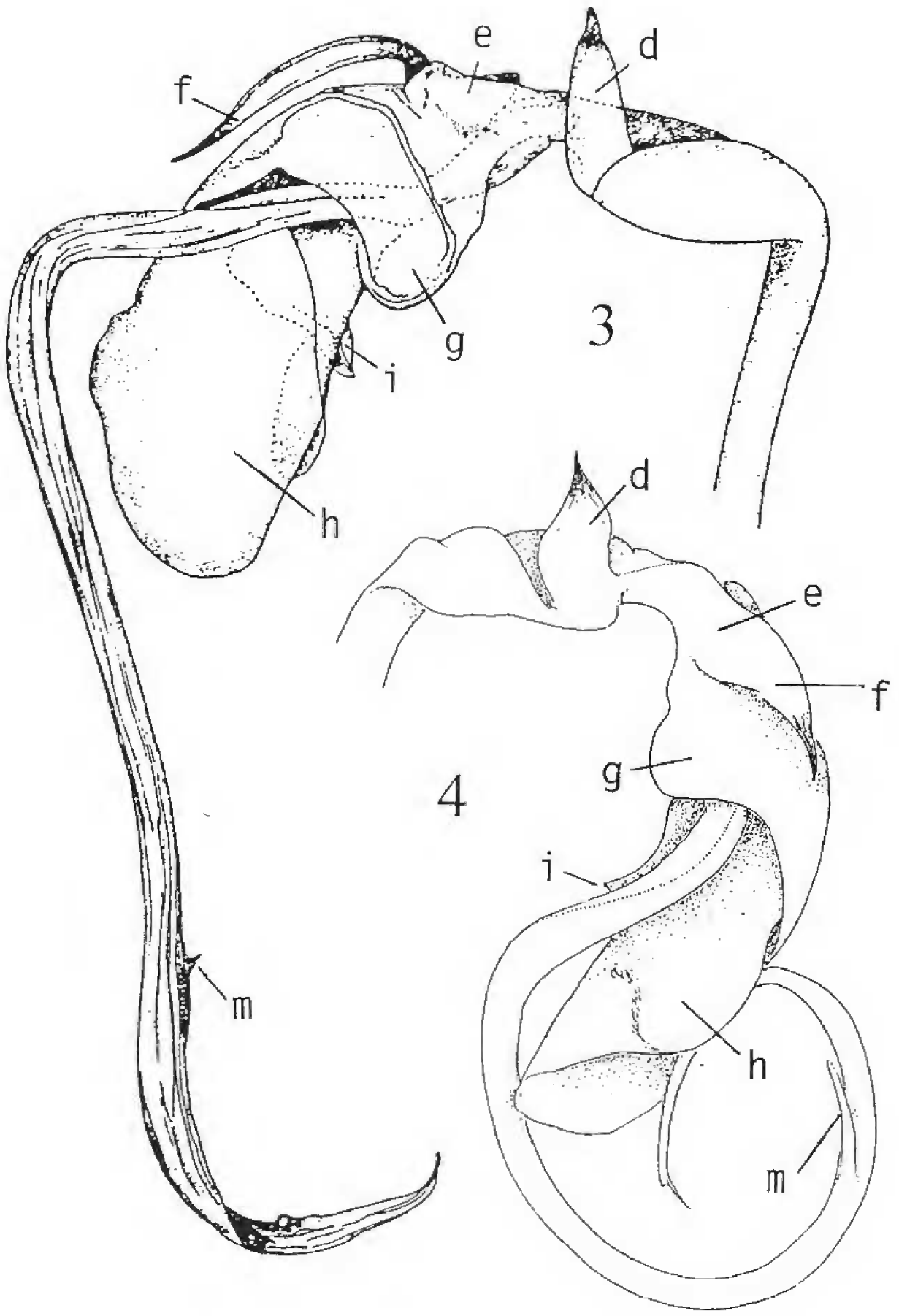
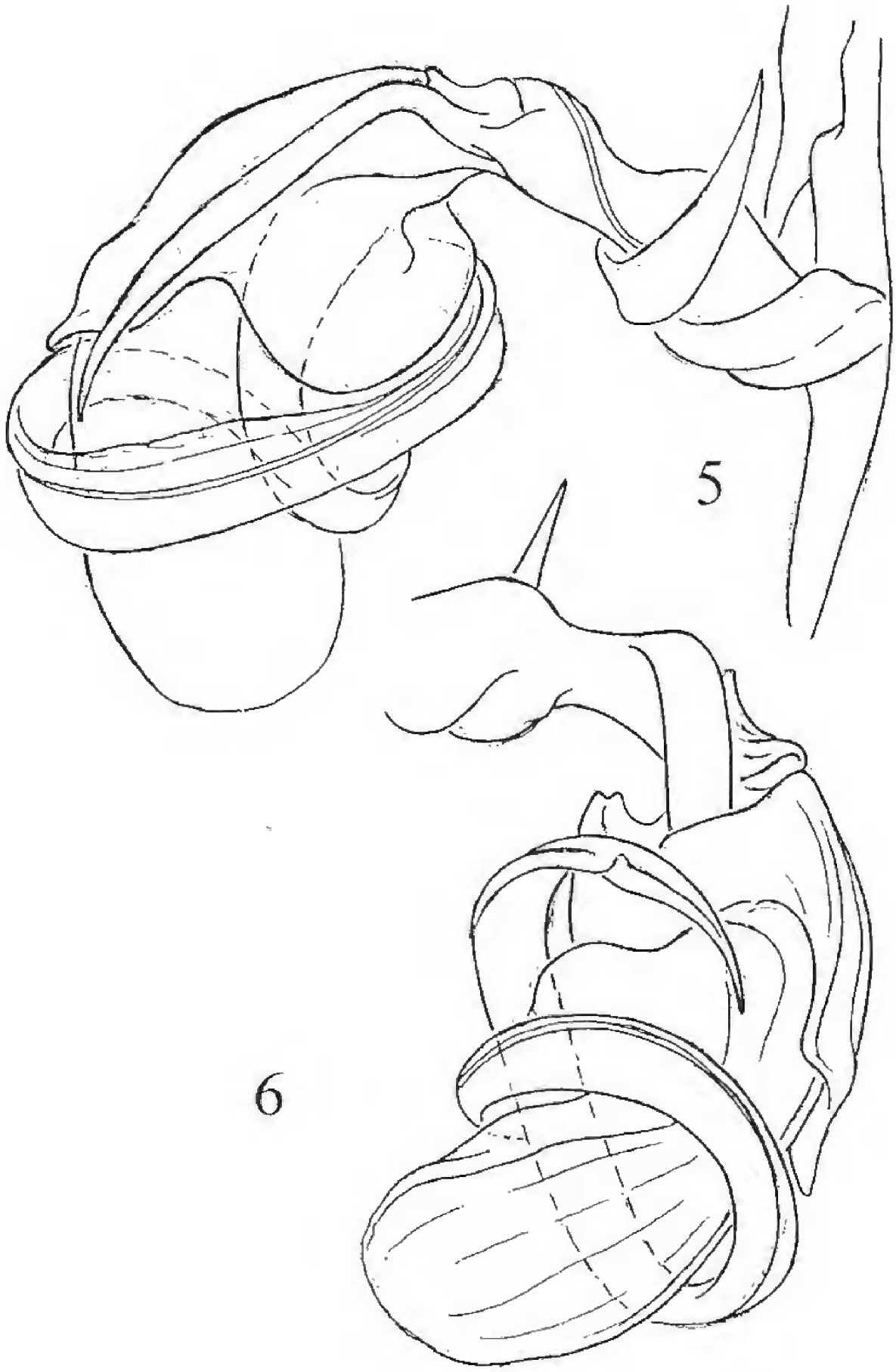


Figs. 3, 4. Gonotelopodites of two species of *Bandeirenica.* 3, *B. caboverdus,* copy of Fig. 5 in Pierrard, 1987, the original lettering preserved but re-oriented. 4, *B. bandeirensis,* copy of Fig. 74 in Kraus, 1958, with lettering added to show homo-logous areas and structures in the two congeneric species. Both figures drawn from the same aspect but of opposite gonopods, producing a mirror-image effect. The pro-longed solenomere in *caboverdus* is an artifact. the normal position of this part is as shown in Figs. 5 and 6.



Figs. 5, 6. Gonotelopodite of *Bandeirenica caboverdus*, drawn from paratype. 5, oral aspect. 6, aboral aspect. The apparent greater length of process "f" from that shown in Fig. 3 is the result of a slightly more oblique angle of observation. Process "m" is present, but not visible in Fig. 6.

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